Acoustic Associates
PETERBOROUGH

Environmental Noise Assessment Associated with a Proposed Residential Development off Balmoral Way, Holbeach

CLIENT:	Ashwood Homes 1 Goodison Road, Lincs Gateway Business Park, Spalding, Lincolnshire PE12 6FY
CONTACTS:	Mr Adam Jagger
REPORTED BY:	Stephen Marshall MIOA, MIDiagE
CHECKED BY:	Chris Gilbert MIOA, FIDiagE
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ACOUSTIC ASSOCIATES (PETERBOROUGH)
111 Spalding Road, Deeping St. James, Peterborough, PE6 8SD.
Tel: 01733 896 346
e-mail: info@aapb.co.uk Website: www.aapb.co.uk

SUMMARY

An environmental noise assessment has been carried out for a proposed residential development off Balmoral Way, Holbeach, on behalf of Ashwood Homes. The assessment was carried out in accordance with the ProPG Planning and Noise Guidance, the National Planning Policy Framework (NPPF) and other relevant noise standards and guidance.

It includes attended noise monitoring, predictive noise modelling, assessment of the results and consideration of noise mitigation measures, where required.

The NPPF assessment carried out shows that, the noise impact on the worst affected proposed dwellings is likely to be at the “Observed Adverse Effect Level”. Should the mitigation measures recommended within this report be adopted, then an acceptable noise situation should occur for future occupants of the proposed dwellings.

The ProPG initial noise risk assessment for the site shows that noise emissions at the locations of the worst affected proposed dwellings are likely to be indicative of a “*Medium Risk”* during the daytime and a *“Medium - High Risk”* during the night-time period. Implementation of a good acoustic design process has therefore been considered to demonstrate that an acceptable noise situation can occur for the future residents of the proposed residential premises.

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1 OBJECTIVES

1.1 To carry out an environmental noise assessment for the proposed residential development off Balmoral Way, Holbeach, in accordance with the ProPG Planning and Noise Guidance (ProPG – Reference 7), the National Planning Policy Framework (NPPF – Reference 1) the Noise Policy Statement for England (NPSE – Reference 2), the National Policy Planning Guidance (NPPG - Reference 3), the World Health Organisation Guidance (WHO – Reference 5) and British Standard (BS) 8233 (Reference 6).

1.2 To recommend solutions to any problems identified by the assessment.

2 CONCLUSIONS

2.1 The dominant noise across the proposed site will be from road traffic on the A17 with minor contribution from road traffic on Foxes Low Road.

2.2 Based on modelling carried out using measurements of road traffic for the worst affected proposed dwellings, the initial site noise risk assessment in accordance with the guidance in the ProPG is:

- *"Medium"* risk in the daytime.
- *"Medium to High"* risk at night-time.

2.3 An acceptable noise situation should occur for residents of the proposed dwellings provided recommendations in this report are carried out.

3 RECOMMENDATIONS

3.1 This report should be used in support of the Planning Application for the proposed residential development off Balmoral Way, Holbeach.

3.2 3.6m high acoustic barriers (minimum surface density of 10kg/m^2, which is to be maintained for the lifetime of the barrier) are proposed along sections of the site boundary to protect residents from road traffic noise. The proposed footprint of the barriers are shown in Figure 2 and a minimum barrier specification is given in Figure 8.

3.3 Plots 37, 50, 51 and 53 will require 2.5m high barriers on the northern boundary of the gardens and Plot 13 will require a 2.1m high barrier around the garden boundary. The location of these barriers is shown in Figure 2 and a minimum barrier specification is given in Figure 8. All other gardens on site should be surrounded by 1.8m high close boarded fencing.

3.4 Ventilation System 1 or 2 (References 4 and 10) is recommended as an acceptable background ventilation strategy in all living rooms and bedrooms. For the living rooms of Plots 13 – 15, 18, 36, 37, 53 and 54, it is likely that "high performing glazing" (R_w (C_{tr}) 43 (-6) dB) and "acoustic trickle vents" ($D_{n,e,w}$ (C_{tr}) 44 (-3) dB) will be required whilst for all other living rooms, standard glazing (R_w (C_{tr}) 29 (-4) dB) and standard trickle vents ($D_{n,e,w}$ (C_{tr}) 31 (0) dB) should suffice. For

the bedrooms of Plots 10 – 23, 31 – 43 and 45 – 64, it is likely that "high performing glazing" (R_w (C_{tr}) 43 (-6) dB) and "acoustic trickle vents" ($D_{n,e,w}$ (C_{tr}) 44 (-3) dB) will be required whilst for all other bedrooms, standard glazing (R_w (C_{tr}) 29 (-4) dB) and standard trickle vents ($D_{n,e,w}$ (C_{tr}) 31 (0) dB) should suffice. Acoustic Associates (Peterborough) can advise further at the detailed design stage when room layouts are finalised. Alternatively if the client chose to adopt Ventilations System 3 or 4, then any system chosen must comply with the noise requirements of Document F (Reference 4). It should be noted that if windows were to be opened to control overheating, then some bedrooms and living rooms may have excessive noise levels internally when windows are temporarily in the open position.

3.5 Acoustic Associates (Peterborough) can advise further at detailed design stage when room layouts are available, but it is likely that they will not be more onerous given that this assessment considers a worst-case.

4 BACKGROUND

Ashwood Homes wish to apply for planning permission for a proposed residential development consisting of 73 dwellings, off Balmoral Way, Holbeach. The site is situated to the immediate South of A17. Road traffic is the dominant noise source across the proposed site. Acoustic Associates (Peterborough) were asked to undertake an environmental noise assessment for the proposed site and this report documents the findings. The location of the site is shown in Figure 1 and the proposed site layout is shown in Figure 2.

5 POLICY, GUIDANCE AND STANDARDS

5.1 National Policy Planning Framework

The National Planning Policy Framework (Reference 1) states the following with respect to noise (para 180).

> *"180. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:*
>
> > *a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life[60];*
> > *b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

The footnote 60 in section a) refers to the Noise Policy Statement for England (NPSE – Reference 2) in order to explain what it means by “adverse impact”.

5.2 Noise Policy Statement for England and National Policy Planning Guidance

The NPSE has stated that the impact of noise be classified according to an “effect level” (shown in column 3 below). The National Policy Planning Guidance (NPPG - Reference (National Policy Planning Guidance, 2014, DEFRA)) has clarified what this effect level below means in terms of its perception by people at receptors and what action should be taken (columns 1 and 4 in Table 1 below).

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 1 - National Policy Planning Guidance noise exposure hierarchy

5.3 World Health Organisation Guidance

5.3.1 The World Health Organisation (WHO) has published guidelines for community noise, as shown in Table 2 (Reference 5). This WHO document gives guidance for the levels of noise both inside and outside of dwellings.

Specific Environment	Critical Health Effect(s)	L_{Aeq} (dB)	Time Base (hours)	L_{Amax}, fast (dB)
Outdoor living area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60

Note: The 'daytime' and 'night-time' periods are generally referred to as 0700 to 2300 and 2300 to 0700 hours respectively.

Table 2 - World Health Organisation Noise Guidance Levels

5.3.2 For impulsive noise, such as that associated with rail movements, WHO states *"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{Amax} more than 10–15 times per night".*

5.4 British Standard (BS) 8233:2014

BS 8233:2014 (Reference 6) also gives guidance on indoor ambient noise levels, as shown in Table 3.

Activity	Location	Noise criteria	
		07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	40 dB $L_{Aeq,16hour}$	-
Sleeping	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Table 3 - BS 8233: 2014 guidance indoor ambient noise levels for dwellings.

5.5 ProPG: Professional Practice Guidance on Planning & Noise (Reference 7)

This document was produced by noise professionals to offer them guidance on noise management within the planning system in England. It recommends a 2-stage approach to managing for noise:

5.5.1 ProPG: Stage 1 – Initial Site Noise Risk Assessment

5.5.1.1 The aim of this stage is to provide an indication of the likely risk of adverse effects due to noise from developing a site. Using measurement and/or prediction, indicative future noise levels on a site are estimated.

5.5.1.2 The following excerpt shows the potential effect associated with likely site noise levels for daytime and night-time.

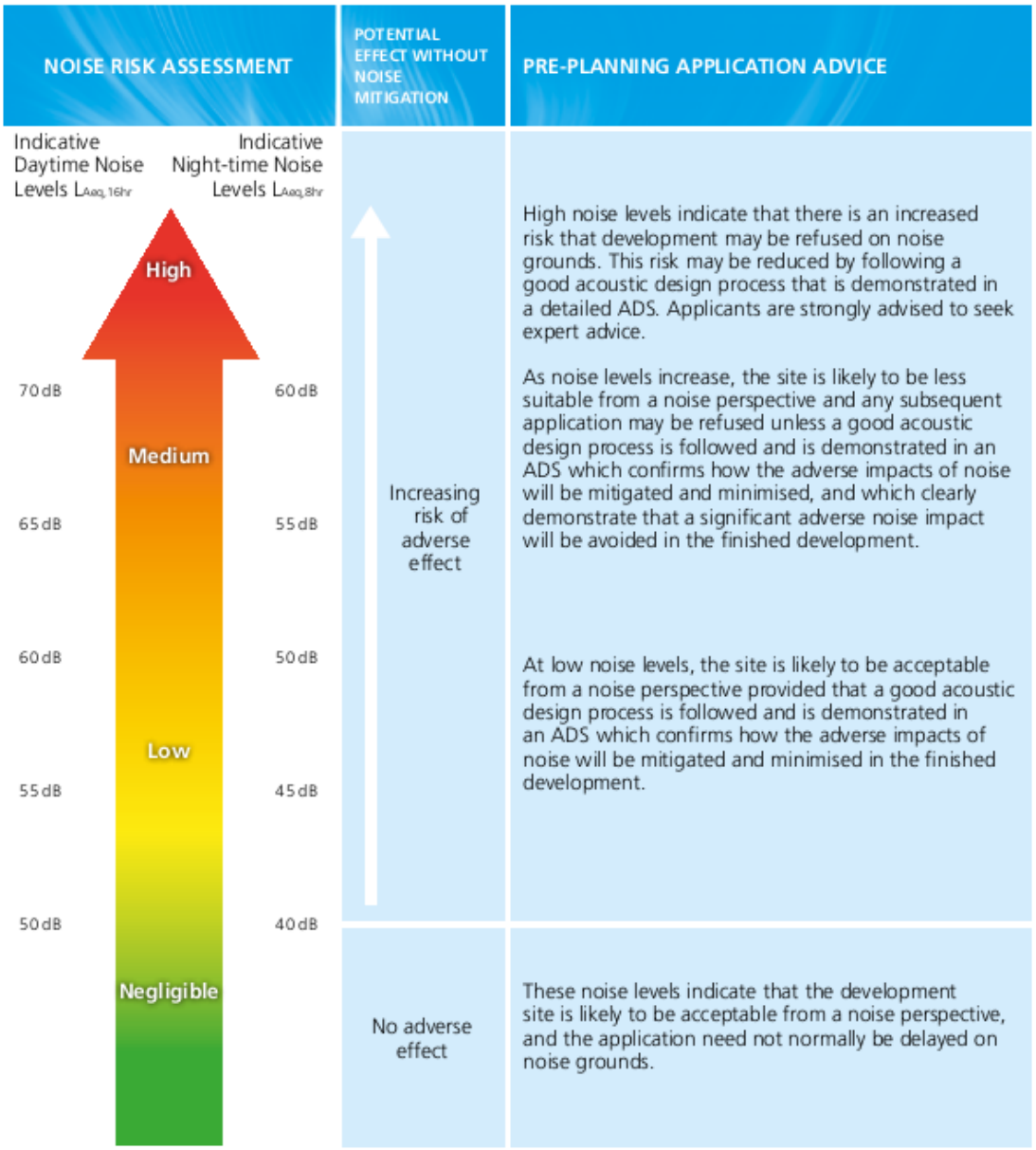


Figure 1. Stage 1– Initial Site Noise Risk Assessment

5.5.1.3 It must be noted that the initial assessment of noise risk is not the basis for the eventual recommendation of approval. Its aim is to give an early assessment of site suitability for residential development and the extent of the acoustic issues to be faced. The higher the risk the more important it is that good acoustic design is followed for the development.

5.5.2 ProPG: Stage 2 – Full Assessment

There are 4 stages to a full assessment and these are briefly described below.

5.5.2.1 Element 1 - Good Acoustic Design Process

Provide an integrated solution whereby development avoids “unreasonable” and prevents “unacceptable” acoustic conditions. In particular the following should be considered: -

- Check the feasibility of relocating or reducing noise levels from relevant sources.
- Consider options for planning the site or building layout.
- Consider the orientation of proposed building(s).
- Select construction types and methods for meeting building performance requirements.
- Examine the effects of noise control measures on ventilation, fire regulation, health and safety, cost, CDM (construction, design and management) etc.
- Assess the viability of alternative solutions.
- Assess external amenity area noise.

5.5.2.2 Element 2 – Internal noise level Guidelines

Seek to achieve recommended noise levels inside noise sensitive rooms in new residential development. The following excerpt from the document shows the recommended internal noise levels that should ideally be achieved.

Activity	Location	Noise criteria	
		07:00 to 23:00	23:00 to 07:00
Resting	Living room	35 dB $L_{Aeq,16hour}$	-
Dining	Dining room / area	40 dB $L_{Aeq,16hour}$	-
Sleeping	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$ 45 dB $L_{Amax,F}$

Table 4 – ProPG Internal Noise Level Guidelines

Note 1: Figure 2 - Note 4 in ProPG states that in most circumstances the maximum noise level $L_{Amax,F}$ should not exceed 10 times per night.

Note 2: Section 2.3.3 of ProPG states the following with respect to the reduction of noise due to the building envelope *“the acoustic performance of the building envelope will be reduced in the event windows are opened for ventilation or cooling purposes, typically reducing the insulation to no more than 10 to 15 dB(A)”.*

Note 7: *Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal L_{Aeq} target levels may be relaxed by up to 5 dB*

and reasonable internal conditions still achieved. The more often internal L_{Aeq} levels start to exceed the internal L_{Aeq} target levels by more than 5 dB, the more that most people are likely to regard them as "unreasonable". Where such exceedances are predicted, applicants should be required to show how the relevant number of rooms affected has been kept to a minimum. Once internal L_{Aeq} levels exceed the target levels by more than 10 dB, they are highly likely to be regarded as "unacceptable" by most people, particularly if such levels occur more than occasionally. Every effort should be made to avoid relevant rooms experiencing "unacceptable" noise levels at all and where such levels are likely to occur frequently, the development should be prevented in its proposed form

5.5.2.3 Element 3 – External Amenity Area Noise Assessment

The acoustic environment of external amenity areas that are an intrinsic part of the overall design assessment should always be assessed and noise levels should ideally not be above the range 50-55 dB $L_{Aeq,16hours}$. However the following follow-up advice should be noted

> *"In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."*

5.5.2.4 Element 4 – Assessment of Other Relevant Issues

At this stage the following should be addressed:

- compliance with relevant national and local policy
- magnitude and extent of compliance with ProPG
- likely occupants of the development
- acoustic design v unintended adverse consequences
- acoustic design v wider planning objectives

5.6 Acoustics, Ventilation and Overheating Guidance (AVOG – Reference 10)

Acoustics design considerations for dwellings may impact on the ventilation and thermal comfort of the inhabitants e.g., closing windows to prevent noise ingress may mean that alternative means are needed to provide fresh air to inhabitants and to prevent overheating. The AVOG design guide details good practice to achieve satisfactory thermal and acoustic comfort for residents. It currently addresses noise from transport sources.

In summary an assessment for a dwelling will consist of the following:

5.6.1 Based on the estimates of noise levels at the façades, advise on glazing specifications to achieve suitable internal noise levels;

5.6.2 Advise the design team on the options for a ventilation strategy team (System 1,2,3 or 4 from Document F of the Building Regulations);

5.6.3 Assess the effects of the ventilation strategy chosen and advise accordingly to prevent noise ingress. This advice could be on measures allowing natural (windows vents or open windows) or other methods such as mechanical ventilation. The following table from AVOG is useful in guiding a design choice for ventilation for outline planning permissions.

Table B-3 Summary of potential noise issues associated with ventilation strategies described in ADF

ADF System	External noise ingress considerations	Mechanical system noise considerations	Approximate guideline free-field external noise limits. [Note 1]
1 or 2	Noise ingress is likely to be defined by the performance of the background ventilators (trickle vents), windows and other façade elements. Note that use of System 1, relying on the use of open trickle vents without opening windows may give rise to poor indoor air quality in airtight dwellings outside the winter period.	For System 1, intermittent kitchen and bathroom fans should have suitable noise levels to meet the guidelines in Table 3-4. System 2 has no mechanical components.	With standard double glazing and two trickle vents: • ~$L_{Aeq,16h}$ 56 dB day • ~$L_{Aeq,8h}$ 51 dB night • L_{AFmax} not normally exceeding ~ 67 dB more than 10x per night With high performing acoustic glazing and two 'acoustic' trickle vents: • ~ $L_{Aeq,16h}$ 66 dB day • ~ $L_{Aeq,8h}$ 61 dB night • L_{AFmax} not normally exceeding ~ 80 dB more than 10x per night
3	Noise ingress is likely to be defined by the performance of the background ventilators (trickle vents), windows and other façade elements. ADF advises that: *"controllable background ventilators having a minimum equivalent area of 2,500 mm² should be fitted in each room, except wet rooms..."*	This could be a centralised or decentralised MEV system. Guideline levels are shown in Table 3-4. For a centralised system, the location of the fan is important for structure-borne and airborne noise. System noise may affect living rooms and bedrooms as well as the rooms in which the extract inlets are located i.e. wet rooms. For a decentralised system, there are individual fans extracting from each bathroom, toilet, kitchen and utility room. The noise effects on adjacent living rooms and bedrooms should be considered. [Note 2]	With standard double glazing and trickle vent: • ~$L_{Aeq,16h}$ 58 dB day • ~$L_{Aeq,8h}$ 53 dB night • L_{AFmax} not normally exceeding ~ 69 dB more than 10x per night With high performing acoustic glazing and an 'acoustic' trickle vent: • ~ $L_{Aeq,16h}$ 68 dB day • ~ $L_{Aeq,8h}$ 63 dB night • L_{AFmax} not normally exceeding ~ 83 dB more than 10x per night
4	No trickle vents required. Consider noise ingress through other facade elements.	MVHR is a centralised system ducted to supply outlets in living rooms and bedrooms as well as to extracts in wet rooms. Guideline levels are shown in Table 3-4. The unit location is important for structure-borne and airborne noise. Consider ducted noise, particularly to bedrooms. Consider also cross-talk sound transmission via ducts. [Note 2]	With standard double glazing and no trickle vent: • ~ $L_{Aeq,16h}$ 62 dB day • ~ $L_{Aeq,8h}$ 57 dB night • L_{AFmax} not normally exceeding ~76 dB more than 10x per night With high performing acoustic glazing: • ~ $L_{Aeq,16h}$ 73 dB day • ~ $L_{Aeq,8h}$ 68 dB night • L_{AFmax} not normally exceeding ~ 90 dB more than 10x per night N.B. With secondary glazing higher sound insulation may be achieved.

5.6.4 Assess the risk of overheating based on input from thermal modelling in a 2 stage assessment. Stage 1 determines whether open windows will suffice to mitigate against overheating. If so, there is no further assessment required for overheating as open windows will suffice;

Table 3-2 Guidance for Level 1 site risk assessment of noise from transport noise sources [Note 1] relating to overheating condition

Risk category for Level 1 assessment [Note 5]	Potential Effect without Mitigation	Recommendation for Level 2 assessment
$L_{Aeq,T}$ [Note 3] during 07:00 - 23:00 / $L_{Aeq,8hr}$ during 23:00 - 07:00 High: 65 dB / 55 dB Medium: 60 dB / 50 dB Low: 55 dB / 50 dB Negligible: 50 dB / 45 dB	Increasing risk of adverse effect	Recommended Optional
	Use of opening windows as primary means of mitigating overheating is not likely to result in adverse effect	Not required

Note 1 The noise levels suggested assume a steady road traffic noise source but may be adapted for other types of transport. All levels are external free-field noise levels.

Note 2 The values presented in this table should not be regarded as fixed thresholds and reference can also be made to relevant dose-response relationships, [15, 17].

Note 3 A decision must be made regarding the appropriate averaging period to use. The averaging period should reflect the nature of the noise source, the occupancy profile and times at which overheating might be likely to occur. Further guidance can be found within the 2014 IEMA Guidelines [23].

Note 4 Refer also to references [1, 17, 18, 22] for further guidance regarding individual noise events. Where 78dB LAFmax is normally exceeded during the night-time period (23:00-07:00), a Level 2 assessment is recommended.

Note 5 The risk of an adverse effect occurring will also depend on how frequently and for what duration the overheating condition occurs. Refer to Figure 3-2.

Note 6 To evaluate the risk category for a dwelling, all three aspects of external noise exposure (i.e. daytime, night-time and individual noise events) should be evaluated. The highest risk category for any of the three aspects applies.

5.6.5 If a Stage 2 assessment is required, then, with input from the design team, advise on measures to achieve acceptable noise levels while preventing overheating could be offered. These could be measures to allow natural input (e.g., plenum windows) or physical measures such as cooling fans. If the latter, then noise emissions must be limited to avoid disturbance.

6 NOISE ASSESSMENT

6.1 Ambient and Background Noise

Attended daytime noise monitoring was carried out at Monitoring Locations A and B (see Figure 1) between 09:25 and 12:33 hours on Thursday 4th February 2021. Attended night-time noise monitoring was carried out at Monitoring Locations A and B between 03:56 – 06:26 hours on Thursday 25th February 2021. Monitoring Location A was approximately 8m from the roadside of the A17, whilst Monitoring Location B was approximately 3m form the roadside of Foxes Low Road. Both locations were in free-field conditions at a height of approximately 1.3m above ground level. The weather conditions during the daytime monitoring period were dry, partial cloud cover, temperatures of approximately 4 to 7°C, with a light south-easterly wind (typically speeds below 2 m/s). The weather conditions during the night-time monitoring period were dry, cloudy, temperatures of approximately 9°C, with a light south-westerly wind (typically speeds of 2 – 3 m/s). Appendix 2 gives details of the noise instrumentation used.

6.2 Specific Noise

The site is affected by noise emissions from two primary noise sources:

- Road traffic on A17
- Road traffic on Foxes Low Road

Measurements taken on site at Monitoring Location A have been used to determine noise emissions from the A17 whilst Monitoring Location B has been used to determine noise emissions from Foxes Low Road.

6.3 Computer noise model of the site and surrounding area

A computer noise model of the site and surrounding area (see Figure 3) was generated using iNoise Computer Noise Modelling Software (Reference 8) which uses the methods given in ISO 9613 –2 (Reference 9) to calculate noise levels across the site. The model was calibrated using the noise measurements taken on site at Monitoring Locations A and B.

7 RESULTS

7.1 Measured noise levels

The results from the attended ambient and background noise measurements at Monitoring Location A and B are shown below in Tables 5 and 6 respectively. The tables show the 'energy average' noise levels ($L_{Aeq,15mins}$), maximum sound pressure levels ($L_{Amax,15mins}$) and background noise levels ($L_{A90,15mins}$).

Date	Time (Hours)	Ambient Noise Level ($L_{Aeq,15mins}$) dB(A)	Background Noise Level ($L_{A90,15mins}$) dB(A)	Maximum Noise Level ($L_{Amax,15mins}$) dB(A)	Comments
4th February 2021	03:56 – 04:11	65.1	30.6	82.4	Noise emissions at this location were dominated by road traffic noise from A17.
	04:11 – 04:26	66.2	32.8	83.7	
	04:26 – 04:41	68.1	41	82.8	
	04:41 – 04:56	69.7	45.1	83.6	
	04:56 – 05:11	69.3	49.5	84.4	
	05:11 – 05:26	70.3	53.2	83	
	05:26 – 05:41	71.3	57.5	83.5	
	05:41 – 05:56	71.9	55.4	90.9	
	05:56 – 06:11	71.4	56.2	81.4	
	06:11 – 06:26	72.7	61.5	83.1	
25th February 2021	09:33 – 09:48	72.5	56	83.7	
	09:48 – 10:03	72.7	54.8	84.3	
	10:03 – 10:18	71.8	52.9	82.8	
	10:18 – 10:33	71.7	57	84.6	
	10:33 – 10:48	72	51.5	84.7	
	10:48 – 11:03	72.7	57.6	85.1	
	11:03 – 11:18	72.4	56	84.1	
	11:18 – 11:33	71.9	55.4	83.3	
	11:33 – 11:48	72.8	57.4	85	
	11:48 – 12:03	71.9	55.6	85.3	
	12:03 – 12:18	72.3	56.6	83.9	
	12:18 – 12:33	72.9	55.6	85	

Table 5 – Measured Noise Levels at Monitoring Location A

Date	Time (Hours)	Ambient Noise Level ($L_{Aeq,15mins}$) dB(A)	Background Noise Level ($L_{A90,15mins}$) dB(A)	Maximum Noise Level ($L_{Amax,15mins}$) dB(A)	Comments
4th February 2021	04:00 – 04:15	56.5	36.8	70.4	Noise emissions at this location were contributed to by a combination of road traffic noise from A17 and also Foxes Low Road.
	04:15 – 04:30	55.9	33.5	68.4	
	04:30 – 04:45	59.5	40.9	81	
	04:45 – 05:00	59.9	45.7	82.4	
	05:00 – 05:15	62.4	49.9	85.2	
	05:15 – 05:30	62.7	53.8	83.3	
	05:30 – 05:45	63.4	53.2	83.3	
	05:45 – 06:00	63.7	55.5	82.9	
	06:00 – 06:15	63.7	55.5	82.9	
25th February 2021	09:25 – 09:40	63.5	53.5	80.3	
	09:40 – 09:55	66	57.3	80.8	
	09:55 – 10:10	63.7	51.7	81.5	
	10:10 – 10:25	63.8	52.3	81.6	
	10:25 – 10:40	61.7	50.3	80.4	
	10:40 – 10:55	61.8	51.4	79.4	
	10:55 – 11:10	64.6	52	80.8	
	11:10 – 11:25	62	51.2	80.5	
	11:25 – 11:40	61.2	51.4	79.7	
	11:40 – 11:55	61.5	52.1	81.2	

Table 6 – Measured Noise Levels at Monitoring Location B

7.2 ProPG Stage 1 – Initial noise risk assessment

The measured noise data was input into a computer model of the site. The predicted output from this software model is shown as noise contours across the existing open site (see Figures 4 and 5 for noise contour map). It is shown in Figure 4 that the worst affected sections of the proposed site are likely to be indicative of a "*Medium risk"* in accordance with the ProPG guidance for the daytime. Figure 5 shows the worst affected sections of the proposed site are likely to be indicative of a "*Medium – High risk*" during the night-time period. Good acoustic design is therefore essential to demonstrate that acceptable noise levels can be achieved for the future occupants of the proposed dwellings.

7.3 ProPG Stage 2 – Full assessment of the four key elements

7.3.1 Element 1 – Good acoustic design process

The following measures should be considered to protect residential amenity inside and outside dwellings:

Orientation of buildings and outdoor amenity areas

Acoustic Associates have worked with Ashwoood Homes during the design phase of the proposed plot layout. As part of this process as many outdoor amenity areas as possible have been positioned in a manner whereby the gardens are shielded from the dominant noise source (the A17) by the dwellings themselves. A 3.6m high acoustic barrier (see Figure 2) has also been recommended along sections of the northern and eastern site boundaries to provide additional protection for the proposed outdoor amenity areas. A buffer zone has also been left along the northern and north-eastern sections of the proposed site to enable acceptable outdoor amenity areas to be achieved for all dwellings.

Orientation of rooms within buildings

The proposed room layouts of the dwellings have not been finalised at this stage. When designing these room layouts Ashwood Homes should try to feature as many living rooms and bedrooms as possible on the façades facing away from the A17.

7.3.2 Element 2 – Internal noise level guidelines

Detailed drawings of proposed room layouts are not available at this stage therefore worst-case assumptions are made based on advice in AVOG (Reference 10). It is also assumed that all buildings will be houses of 2 stories height and that all living rooms will be on the ground floor and all the bedrooms will be on the first floor. Table B-3 from AVOG (see section 5.6.3) is referenced in recommending a ventilation strategy for the development.

Ventilation and Glazing

Living rooms:

Predicted daytime noise levels at the ground floor façades of Plots 13 – 15, 18, 36, 37, 53 and 54 are between $L_{Aeq,16hours}$ 56 – 60 dB(A), whilst all other plots are exposed to ground floor façade levels below $L_{Aeq,16hours}$ 56 dB(A). Therefore system 1 is appropriate for all living rooms across the proposed site. For the living rooms of Plots 13 – 15, 18, 36, 37, 53 and 54, it is likely that “high performing glazing” (R_w (C_{tr}) 43 (-6) dB) and “acoustic trickle vents” ($D_{n,e,w}$ (C_{tr}) 44 (-3) dB) will be required whilst for all other living rooms, standard glazing (R_w (C_{tr}) 29 (-4) dB) and standard trickle vents ($D_{n,e,w}$ (C_{tr}) 31 (0) dB) should suffice..

Bedrooms:

Predicted night-time noise levels at the first floor façades of Plots 10 – 23, 31 – 43 and 45 – 64 are between $L_{Aeq,8hours}$ 51 – 60 dB(A), whilst all other plots are exposed to first floor façade levels below $L_{Aeq,8hours}$ 51 dB(A). Therefore system 1 is appropriate for all bedrooms across the proposed site. For the bedrooms of Plots 10 – 23, 31 – 43 and 45 – 64, it is likely that “high performing glazing” (R_w (C_{tr}) 43 (-6) dB) and “acoustic trickle vents” ($D_{n,e,w}$ (C_{tr}) 44 (-3) dB) will

be required whilst for all other bedrooms, standard glazing (R_w (C_{tr}) 29 (-4) dB) and standard trickle vents ($D_{n,e,w}$ (C_{tr}) 31 (0) dB) should suffice.

Overheating

Comparison with the values shown in Table 3-2 of AVOG (see section 5.6.4) shows that the worst affected living rooms and bedrooms on the proposed site are likely to be exposed to façade noise levels whereby a Stage 2 overheating assessment may be requested.

If a Stage 2 assessment is required, then, with input from the design team, advice on measures to achieve acceptable noise levels while preventing overheating could be given. These could be measures to allow natural input (e.g., plenum windows) or physical measures such as cooling fans. If the latter, then noise emissions must be limited to avoid disturbance.

7.3.3 Element 3 – External amenity area noise assessment

Protection of outdoor amenity areas

This report recommends that 3.6m high acoustic barriers are installed along sections of the site boundary to protect residents from road traffic noise (see Figure 2). Plots 37, 50, 51 and 53 will require 2.5m high barriers on the northern boundary of the gardens and Plot 13 will require a 2.1m high barrier around the garden boundary. The location of these barriers is shown in Figure 2 and a minimum barrier specification is given in Figure 8. All other gardens on site should be surrounded by 1.8m high close boarded fencing. With these control measures in place noise levels within the outdoor amenity areas of all proposed dwellings range between $L_{Aeq,16hour}$ values of 40 – 55 dB(A). These levels are at a level where even for the worst affected plots an acceptable noise level in accordance with the ProPG and WHO guidelines should be achieved. This is deemed to be an acceptable noise situation.

7.3.4 Element 4 – Assessment of Other Relevant Issues

Using the noise impact criteria from the Noise Policy Statement for England (NPSE) and the NPPG the assessment carried out shows that, the noise impact on the worst affected proposed residential dwellings is likely to be at a level where an “Observed Adverse Effect” could occur. Provided the recommended noise mitigation measures are installed, then this is deemed to be an acceptable noise situation.

There are no other relevant issues likely to affect this assessment as detailed in Element 4 of the ProPG Stage 2 Assessment.

7.4 ProPG Stage 2 – Recommendation to the decision maker

It is recommended that the mitigation measures proposed within the recommendations section of this report are implemented as part of the development and the recommendation to the decision maker is that Planning Permission should be awarded, subject to these conditions.

8 UNCERTAINTIES

Some small uncertainties do exist regarding whether the ongoing Covid 19 pandemic resulted in less road traffic activity than would be anticipated under more normal times. However a small change in traffic levels is unlikely to impact upon the reports conclusions.

The uncertainties relating to the use of predictive modelling are likely to be ± 3 dB(A).

REFERENCES

1. *National Policy Planning Framework;* DCLG, 2012.
2. *Noise Policy Statement for England;* DEFRA, 2010.
3. *National Policy Planning Guidance, 2014, DEFRA*.
4. *Document F Ventilation Regulations;* thenbs, 2010.
5. *World Health Organisation Guidance, Guidelines for Community Noise;* WHO, 1999.
6. *British Standard BS 8233, Guidance on sound insulation and noise reduction for buildings;* BSI, 2014.
7. *Professional Practice Guidance on Planning & Noise: New Residential Development;* ProPG, 2017.
8. *iNoise Computer Noise Modelling Software.*
9. *ISO 9613-2 Acoustics of sound during propagation outdoors, Part 2: General method of calculation;* ISO, 1996.
10. *ANC + IOA. Acoustics Ventilation and Overheating Guide V1.1;, 2020.*

Appendix 1 – Glossary of terms

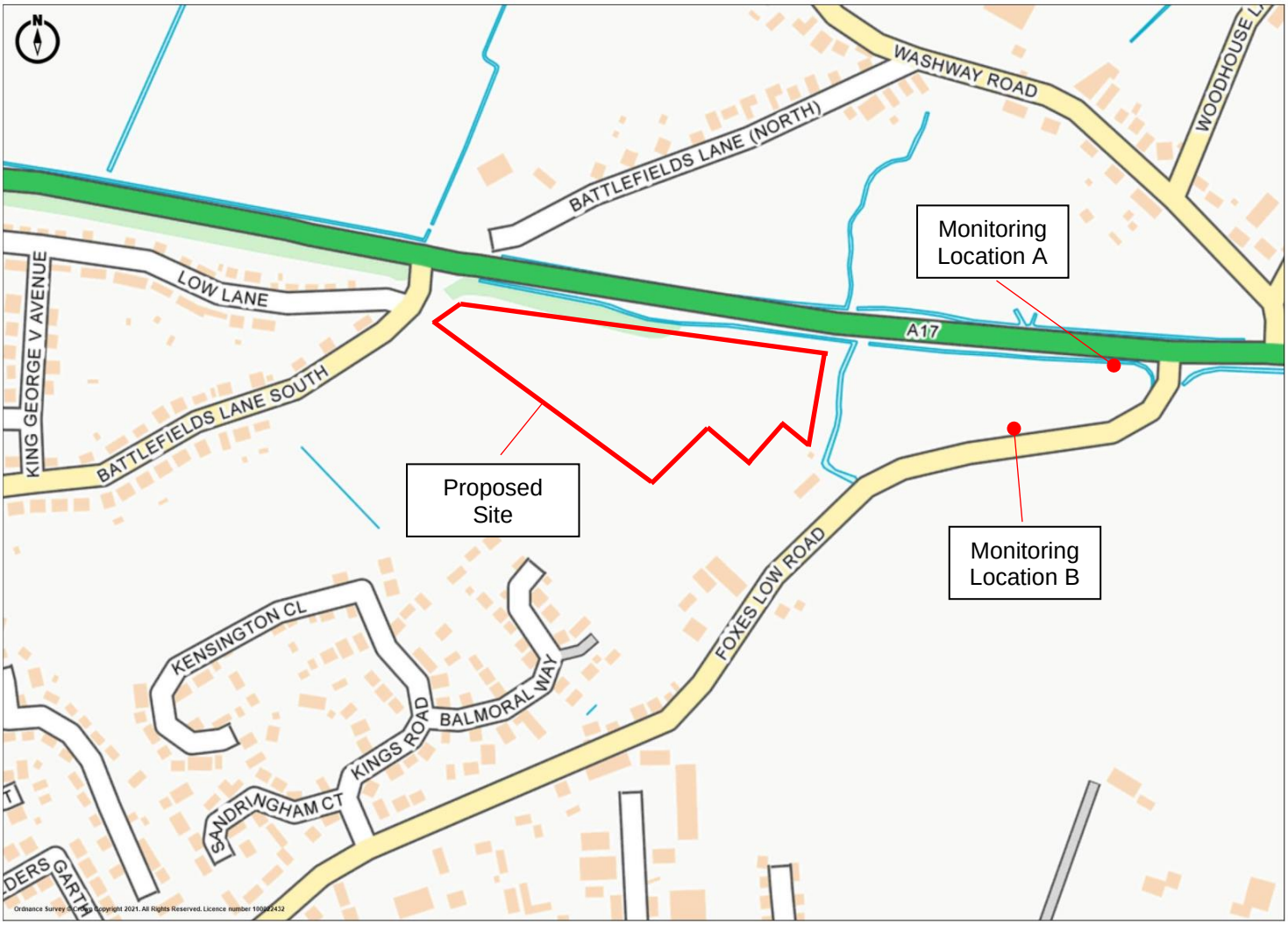
Sound Pressure	The variation of ambient pressure that is detected by the ear as sound.
Noise	Unwanted sound
deciBel (dB)	Ten times the logarithm of the square of the ratio of the Sound Pressure to a reference pressure (20 micro-Pascal's).
Sound Pressure Level (Lp)	The decibel version of the Sound Pressure.
A-Weighting	A frequency weighting which simulates the response of the ear. An A-Weighted Sound Pressure Level is denoted by L_{pA} and has units of dB(A)
$L_{Aeq,T}$	The value of the A-weighted sound pressure level, in decibels [dB(A)], of a continuous steady sound that within a specified time interval (T), for example 16 hours, has the same mean-square sound pressure as a sound that varies with time. Therefore, the average over a 16 hour period would be denoted as $L_{Aeq,16h}$
$L_{Amax,T}$	The maximum A-Weighted sound pressure level that was encountered during the measurement period.
$L_{A90,T}$	The A-Weighted sound pressure level that is exceeded for 90% of the time (T). This is usually used a measure of background noise.
Free Field	Where noise can propagate freely without any reflections from buildings etc.
Octave Band	A band of frequencies the upper limit of which is twice the lower limit. They are known by their centre frequency, e.g., 63, 125, 250, 500, 1000, 2000
NPSE Critera	
NOEL	No Observed Effect Level
LOAEL	Lowest Observed Adverse Effect Level
SOAEL	Significant Observed Adverse Effect Level
Ambient Noise	Total sound in a given situation at a given time.
Residual Noise	The ambient noise remaining at a given position in a given situation when the specific noise is suppressed to a degree such that it does not contribute to the ambient noise.
Specific Noise Level	The dB $L_{Aeq,Tr}$ of the noise sources being assessed at a site.

Appendix 2 – Noise instrumentation

Type	Manufacturer	Description	Serial Number	Last Calibration Date	Calibration Certificate No.
Svan 957	Svantek	Sound level meter	27517	21/02/2020	197033
GA 607	Castle	Sound level calibrator	039873	27/01/2020	196161
Svan 945A	Svantek	Sound level meter	9485	01/05/2019	187795

The calibration of the instrumentation was checked at the start and end of the tests and there was no significant drift.

Figure 1 - Location Plan



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LANDMARK INFORMATION

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Plotted Scale - **1:5000**. Paper Size - **A4**

Figure 2 – Proposed Site Layout

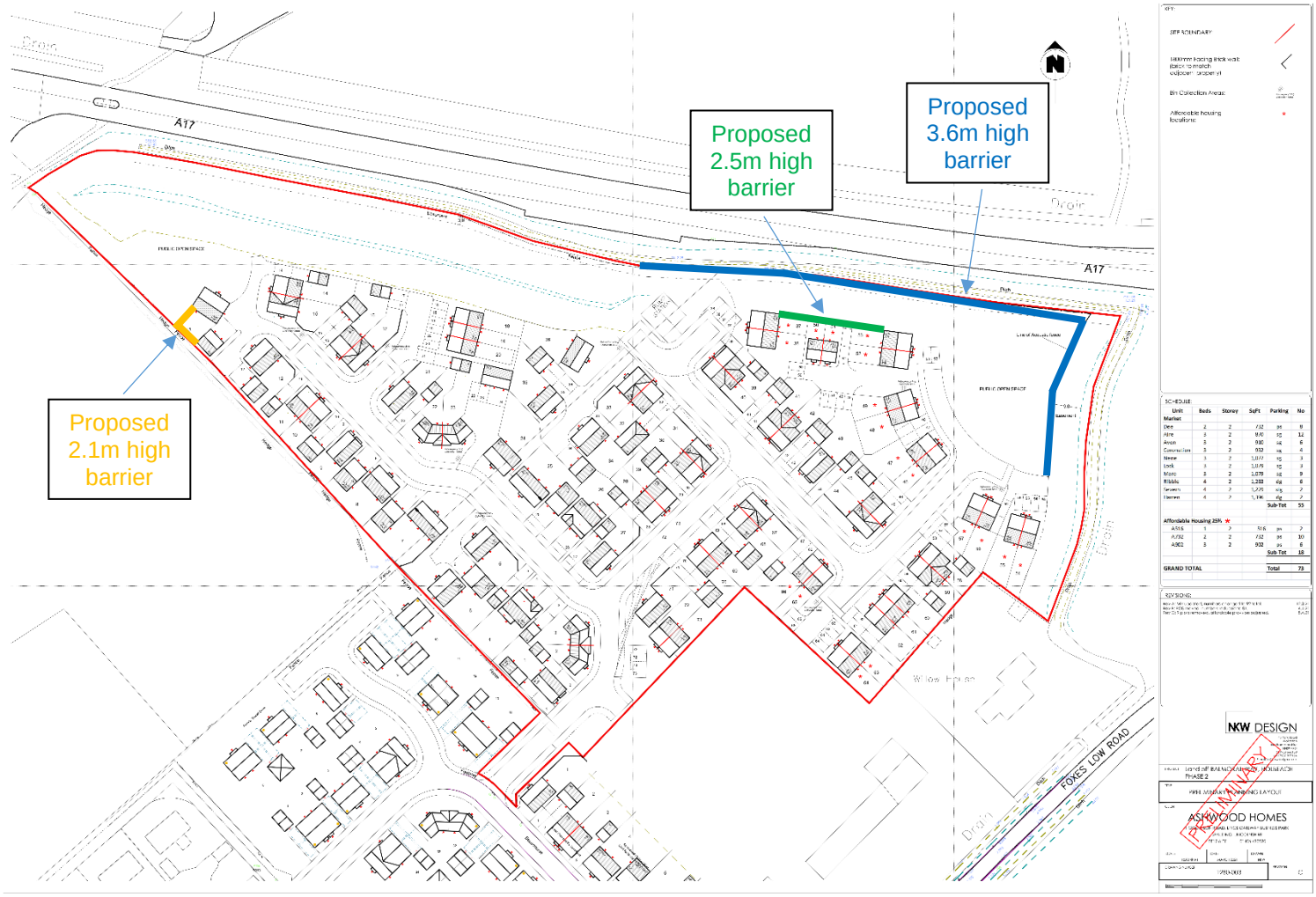


Figure 3 – Computer Noise Model of the Site

Acoustic Associates
PETERBOROUGH

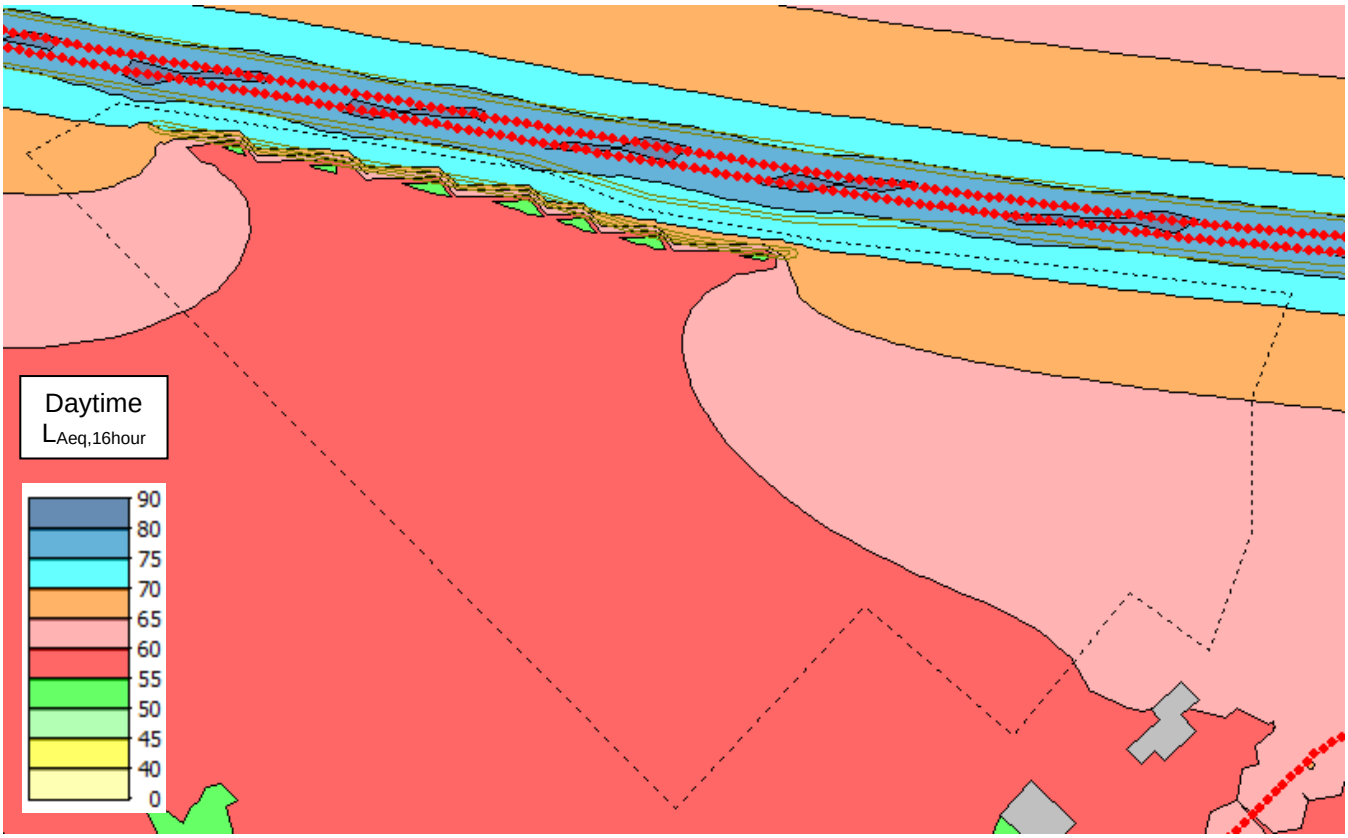
Client: Ashwood Homes

Handled by: Stephen Marshall MIOA, MIDiagE

Project: Proposed Residential Development off Balmoral Way, Holbeach

Noise contours for illustrative purposes only

Figure 4 – Daytime noise contours at 1.5m above ground level (Existing Site)



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PETERBOROUGH

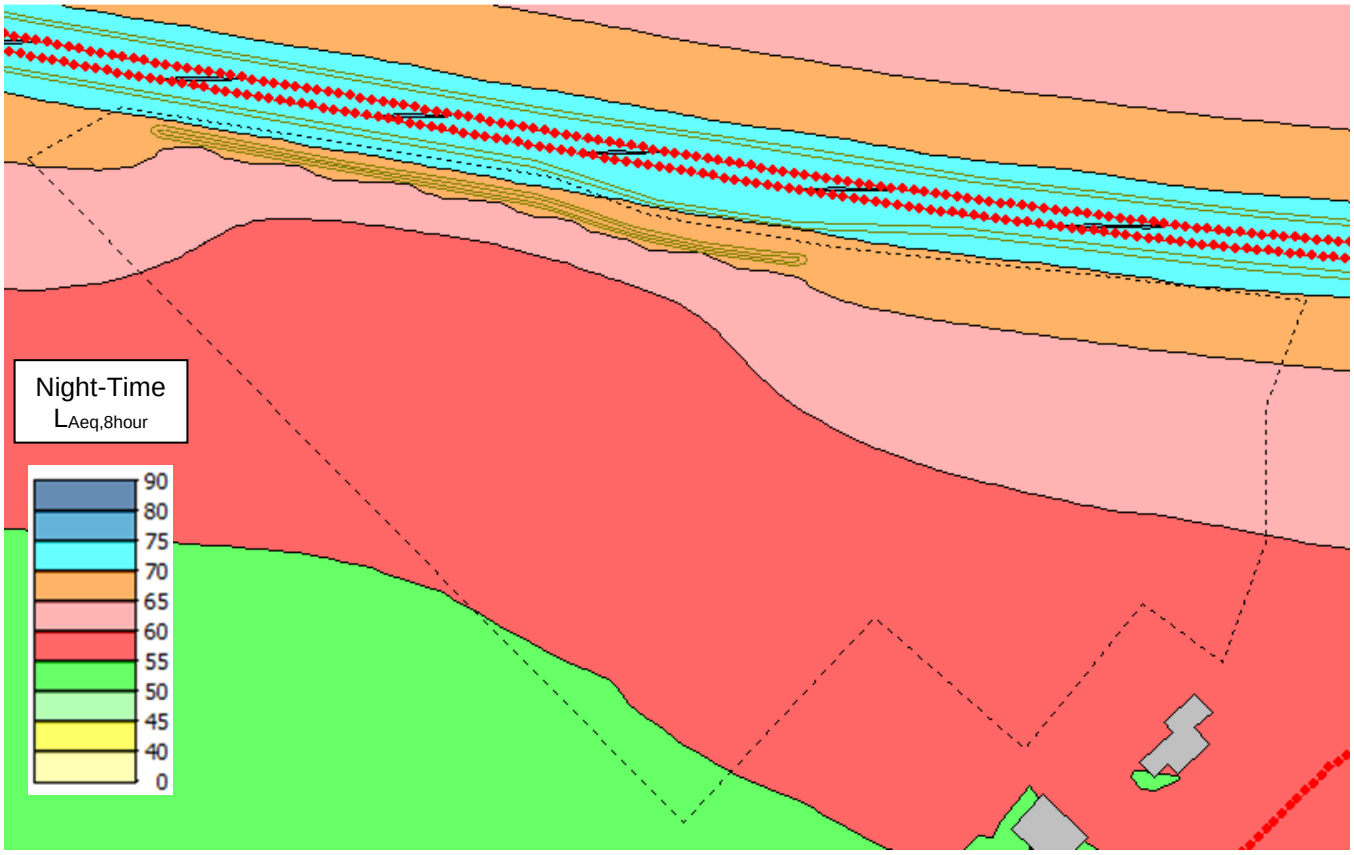
Client: Ashwood Homes

Handled by: Stephen Marshall MIOA, MIDiagE

Project: Proposed Residential Development off Balmoral Way, Holbeach

Noise contours for illustrative purposes only

Figure 5 – Night- time noise contours at 4.5m above ground level (Existing Site)



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Noise contours for illustrative purposes only

Figure 6 – Daytime noise contours at 1.5m above ground level (Proposed Site)

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Client: Ashwood Homes

Handled by: Stephen Marshall MIOA, MIDiagE

Project: Proposed Residential Development off Balmoral Way, Holbeach

Noise contours for illustrative purposes only

Figure 7 – Night-time noise contours at 4.5m above ground level (Proposed Site)

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Client: Ashwood Homes

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Project: Proposed Residential Development off Balmoral Way, Holbeach

Noise contours for illustrative purposes only

Figure 8 – Acoustic Barrier Guidance

Any material can be used to construct the acoustic barriers, with a minimum surface density of 10 kg/m². This will give noise attenuation up to 20 dB.

It is advised that the minimum thickness of a wooden fence is at least 14mm and is overlapped as shown below.

Suitable Wooden Fence Configurations: